Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules Governing	)	RM-11660
Radiated Power Limits in the Cellular Radio	)	DA 12-701
Service Frequency Bands	)	

REPLY COMMENTS OF VERIZON WIRELESS

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SUMMARY

AT&T asks the Commission to restate the current ERP limits for cellular base stations as power spectral density ("PSD") limits, in order to foster the expansion of wireless broadband services into the cellular spectrum bands. Verizon Wireless agrees that the cellular rules should be amended to include a PSD limit option. However, rather than adopting relatively low PSD limits as AT&T proposes, the Commission should adopt both PSD and power flux density ("PFD") limits. By adopting PSD and PFD limits, the Commission can adopt PSD limits consistent with those adopted for other bands, resulting in better coverage and data throughput, while still protecting adjacent licensees from harmful interference.

AT&T proposes PSD limits for cellular that are significantly lower than those adopted for use in the 700 MHz bands. AT&T chose these lower PSD limits in order to ensure against receiver overload interference to receivers operating in adjacent frequency bands. Verizon Wireless agrees with the GSM Licensees' comments that the lower PSD limits will restrict both coverage and capacity and put carriers deploying broadband technologies in the cellular bands at a disadvantage. In adopting relatively higher PSD limits for the 700 MHz bands, the Commission chose to protect adjacent licensees from harmful interference by adopting PFD limits in addition to PSD limits.

The Commission should take the same approach here and adopt the PSD and PFD limits that apply to the Upper 700 MHz bands for use in the cellular frequency bands. In order to address the concerns raised by the GSM licensees and ensure that narrowband systems are not negatively impacted by a change to PSD limits, the Commission should retain the current Section 22.913(a) ERP limits as an option for carriers deploying narrowband technologies in the cellular bands. The Commission has previously recognized PFD limits as an effective way to

mitigate the potential for interference to adjacent licensees. Tests commissioned by Verizon Wireless for this proceeding confirm that cellular signals operating within the 700 MHz PFD limits would not cause harmful interference. .

Determining power based on PSD limits will result in broadband technologies being able to match the PSD levels and coverage characteristics currently produced by narrowband systems under the current cellular rules. Accordingly, contrary to the concerns expressed by one party, the signal levels at or near the market boundaries produced by broadband technologies under the proposed PSD and PFD limits will not be greater than currently permitted and experienced levels. Should operation under the proposed rules result in extensions into adjacent markets, however, the adjacent market licensee would be protected under several provisions in the cellular rules.

For all of these reasons, the Commission should initiate a rulemaking aimed at adopting the PSD and PFD rules applicable to the Upper 700 MHz bands for use in the cellular bands.

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This proceeding offers the Commission a good opportunity to foster the expansion of wireless broadband services into the cellular spectrum bands.

AT&T has petitioned the Commission to begin a rulemaking to update its decades-old cellular technical rules to enable carriers to deploy broadband services. AT&T asks that the current rule, 47 C.F.R. § 22.913, which sets forth maximum effective radiated power ("ERP") limits for cellular base stations, be replaced with a power spectral density ("PSD") limit of 250 watts/MHz in non-rural areas and 500 watts/MHz in rural areas.[1] AT&T argues that the requested rule change would eliminate unintended penalties on the deployment of advanced digital technologies in the cellular bands associated with the current rule; bring the cellular rules in line with the radiated power rules for other CMRS bands; and keep adjacent licensees and services free from harmful interference.[2]

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[1] *Amendment of the Commission's Rules Governing Radiated Power Limits in the Cellular Radio Service Frequency Bands*, Petition for Expedited Rulemaking and Request for Waiver, RM 11660, filed February 28, 2012 ("Petition"), at 3. The current rule limits maximum ERP to 500 watts for non-rural areas and 1000 watts for rural areas. 47 C.F.R. § 22.913(a).

[2] Petition at 3.

Comments filed in response to the Petition were generally supportive of AT&T's rulemaking request, though one party expressed concerns about interference to adjacent licensees,[3] while another argued that the current power limits must be retained for narrowband operations to avoid reducing narrowband coverage, and that the PSD limits for broadband technologies should be higher.[4] Verizon Wireless agrees with AT&T that the current Section 22.913 ERP limits would penalize carriers deploying broadband technologies in the cellular bands by preventing carriers from achieving the same coverage footprint as less efficient narrowband technologies. Accordingly, Verizon Wireless agrees that Section 22.913 should be amended to include a PSD limit option to facilitate deploying broadband technologies in the cellular band. Rather than adopting relatively low PSD limits as AT&T proposes, however, the Commission should adopt both PSD and power flux density ("PFD") limits.[5] By adopting PSD and PFD limits, the Commission can adopt PSD limits consistent with those adopted for other bands, resulting in better coverage and data throughput, while still protecting adjacent licensees from harmful interference. Accordingly, Verizon Wireless supports the prompt commencement

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[3] Bluegrass Cellular Comments, RM-11660, filed May 31, 2012 ("Bluegrass Comments") at 2-3.

[4] Joint Comments of Broadpoint, LLC D/B/A Cellular One; Cincinnati Bell Wireless LLC; NE Colorado Cellular, Inc.; Smith Bagley, Inc.; Union Telephone Company D/B/A Union Wireless, RM 11660, filed June 1, 2012 ("GSM Licensee Comments") at 2-9.

[5] PFD represents the total power in a portion of spectrum localized over an area on the ground relative to a nearby base station transmitter. PFD limits are used to establish maximum in-band co-channel signal levels on the ground near the base station. Limiting PFD levels near the base station is an effective way to ensure that signal strength generated by the base station does not over power receivers operating on adjacent bands.

of a rulemaking proceeding aimed at adopting the PSD and PFD rules applicable to the Upper 700 MHz bands for use in the cellular bands.[6]

I. THE COMMISSION HAS RECOGNIZED THE BENEFITS OF PSD LIMITS AND ADOPTED THEM FOR USE IN OTHER BANDS.

In the Petition, AT&T explains that newer wideband technologies are being deployed both to improve spectral efficiencies and increase data throughput. However, because the current cellular power limits are stated as maximum ERP per channel, the rules tend to favor technologies that use narrow-bandwidth channels (also referred to as "carriers" or "emissions"). Thus, for example, the current cellular rules would allow a carrier deploying GSM technology, which uses 200 kHz channels, to use up to 500 Watts ERP for non-rural areas in each channel. Its power spectral density, stated as ERP/MHz, would be 2,500 Watts/MHz ("w/MHz"). By contrast, newer technologies using 10 MHz channels would be limited to 500 Watts per 10 MHz channel, resulting in a PSD of 50 w/MHz -- which is 2 percent of the PSD allowed under the rules for GSM technologies. These lower PSDs for broadband technologies result in reduced coverage per cell site, reduced system performance and data throughput, and less efficient spectrum use.[7]

As noted in the Petition, the Commission previously adopted PSD limits for use in the 700 MHz,[8] PCS and AWS bands.[9] In the PSD Order, the Commission stated, "we believe that

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[6] Verizon Wireless takes no position on AT&T's request for a waiver of the current rule during the pendency of the rulemaking proceeding.

[7] Petition at 9-12.

[8] *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, Report and Order and Further Notice of Proposed Rulemaking, WT Docket No. 06-150, 22 FCC Rcd 8064, 8098-8103 (2007) ("700 MHz Service Rules Order").

this [PSD] model will better accommodate newer technologies employing wider bandwidths – by establishing EIRP caps on a 'per megahertz of spectrum bandwidth' basis rather than on a 'per emission' basis."[10] The Commission declined, however, to adopt PSD limits for the cellular bands. It was concerned that the frequencies immediately adjacent to the 800 MHz cellular band were undergoing significant restructuring, and it wanted additional time to assess the impacts of additional power limit changes in that band.[11]

AT&T states that since 2008, the re-banding of services adjacent to the cellular bands is almost completed, and carriers and the Commission have gained real-world experience using PSD limits in the PCS and AWS bands. Accordingly, it argues that the time is right for the Commission to reconsider adopting PSD limits for the cellular bands.[12] Verizon Wireless agrees.

II. THE COMMISSION SHOULD ADOPT PSD AND PFD LIMITS RATHER THAN THE PSD LIMITS PROPOSED BY AT&T.

A. The PSD Limits Proposed by AT&T Would Limit Coverage and Capacity as Compared to the 700 MHz PSD Limits.

AT&T proposes PSD limits for cellular that are significantly lower than those adopted for use in the 700 MHz bands. Thus, while the Upper 700 MHz PSD limit is 1000 w/MHz for non-

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[9] *Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27 and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, Third Report and Order, WT Docket No. 03-264, 23 FCC Rcd 5319, 5329-5330 (2008) ("PSD Order").

[10] *Id.,* at 5329-5330. *See also,* 700 MHz Service Rules Order at 8098-8099.

[11] PSD Order at 5341.

[12] Petition at 8. None of the commenting parties challenge the need to adopt PSD limits for broadband technologies in the cellular bands.

rural areas and 2000 w/MHz for rural areas,[13] AT&T proposes a PSD for cellular of only 250 w/MHz for non-rural areas and 500 w/MHz for rural areas. Verizon Wireless is concerned that the lower PSD limits will negatively impact both coverage and capacity. This same concern was raised by the GSM Licensees, who argued that the relatively low PSD limits proposed by AT&T would result in higher frequency systems operating in PCS and AWS bands being able to cover greater distances.[14]

The 700 MHz PSD limits are 4 times higher than those proposed by AT&T, which translates into a 6 dB increase in PSD. For a typical market environment, this 6 dB increase will translate into a 60% increase in coverage range and 2.5 times the coverage area, including improved in building coverage. Coverage range and area improvements associated with the proposed PSD limits are based on typical market environments. Rural markets, which have better propagation characteristics, will experience greater coverage range and area improvements (i.e., 74% increase in coverage range and 3 times the coverage area). The PSD increase will also result in an increase of at least two times the downlink capacity and throughput speeds for 4G broadband services, which is attributable to improved signal to noise ratios for those services. Improving the capacity and user throughput speeds proportionately increase the spectrum efficiency (measured in bits per second per hertz) of broadband services. If the power levels proposed by AT&T were adopted, the reductions in coverage and capacity could put carriers deploying broadband technologies in cellular bands at a significant disadvantage as compared to

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[13] *See* 47 C.F.R. § 27.50(b)(4)-(5) (limits cited are for antenna heights not exceeding 305 meters). For base stations transmitting on bandwidths of 1 MHz or less, the limit is 1000 w (for non-rural) and 2000 w (for rural) for the entire emission bandwidth. *See* 47 C.F.R. § 27.50(b)(2)-(3).

[14] GSM Licensee Comments at 8-9.

carriers deploying such technologies in other bands. These service and coverage impacts will be greatest in rural areas – the areas where the Commission is most concerned about promoting the deployment of broadband technologies.

B. Adopting Both PSD and PFD Limits Would Allow PSD Limits Consistent with other Bands Resulting in Better Coverage and Capacity.

AT&T chose these lower PSD limits in order to ensure against receiver overload interference to receivers operating in adjacent frequency bands, including public safety radios.[15] While Verizon Wireless agrees that the cellular power limits should not create greater potential for harmful interference to adjacent operations, there are ways to increase the PSD limits for cellular – thus improving coverage and capacity – without harming adjacent licensees. In the 700 MHz Service Order, the Commission adopted PFD limits in addition to PSD limits.[16] The Commission's rules for the Upper 700 MHz bands provide that "the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure."[17] The Commission adopted this requirement in order to "mitigate the potential for interference to adjacent channel operations" and to "remain especially vigilant regarding the potential for interference to public safety operations."[18]

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[15] Petition at 12-13.

[16] 700 MHz Service Rules Order at 8101-8102; 47 C.F.R. § 27.55(c).

[17] 47 C.F.R. § 27.55(c).

[18] 700 MHz Service Rules Order at 8101, ¶ 97.

PFD limits are beneficial for several reasons. First, they protect adjacent band receivers by limiting the signal strength in close proximity to the base station. As the Commission has stated, "Through the use of an appropriate PFD limit, a transmission from a 50 kW ERP base station can appear, to an adjacent band receiver operating in the vicinity of a base station, like a transmission from a 1 kW base station operating without a PFD constraint."[19] Second, they provide flexibility to licensees to determine how best to meet the PFD limits. A licensee can control the PFD in areas near base stations either by reducing power or by aiming the signal away from the ground (i.e., by adjusting a combination of antenna vertical gain pattern, antenna height and antenna down tilt) to achieve a particular PFD. Thus, a licensee is able to deploy spectrally efficient broadband services at higher power levels while aiming the signal away from the ground. Third, by using PFD limits in addition to PSD limits, the rules can allow licensees to operate at greater power levels without sacrificing protection. Fourth, adopting PSD and PFD limits would make the cellular band power rules both technology neutral – by eliminating the bias in the current rule towards narrowband technologies – and consistent with other bands including AWS, PCS and 700 MHz. This change to AT&T's proposal would address the concerns raised by the GSM Licensees that AT&T's proposed PSD limits would disadvantage carriers deploying broadband technologies in the cellular bands compared to carriers deploying such technologies in other bands.[20] For all these reasons, the Commission should adopt both PSD and PFD limits for the cellular band.

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[19] *Id.,* at 8097, fn 203.

[20] *See* GSM Licensee Comments at 8-9.

III. THE PSD AND PFD LIMITS THAT APPLY TO THE UPPER 700 MHZ BANDS WILL PROTECT ADJACENT SERVICES FROM HARMFUL INTERFERENCE.

A. The Commission Should Adopt the PSD and PFD Limits that Apply to the Upper 700 MHz Bands for the Cellular Bands.

Verizon Wireless supports adopting the PSD and PFD limits that apply to the Upper 700 MHz bands for use in the cellular frequency bands. In particular, the Commission should amend Section 22.913(a) of the cellular rules to allow carriers the option of using the non-rural and rural PSD limits set forth in Section 27.50(b)(4) and (5)[21] for emission bandwidths greater than 1 MHz, and the PFD limits set forth in Section 27.55 (c).[22] In order to address the concerns raised by the GSM licensees and ensure that narrowband systems are not negatively impacted by a change to PSD limits, the Commission should retain the current Section 22.913(a) ERP limits as an option for carriers deploying narrowband technologies in the cellular bands. In the alternative, the Commission could adopt maximum power limits of 1000w and 2000w respectively for non-rural and rural areas when the emission bandwidth is 1 MHz or less.[23]

The 700 MHz PSD and PFD limits are appropriate for use in the cellular bands for several reasons. First, these limits have been in use in the 700 MHz bands without issue.[24] Carriers and the Commission are therefore familiar with these limits and their use. Second, the propagation characteristics of the cellular band are similar to, but slightly less than, those of the 700 MHz frequency bands. As such, using the same PSD and PFD limits for cellular should

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[21] 47 C.F.R. § 27.50(b)(4)-(5).

[22] 47 C.F.R. § 27.55(c).

[23] *See* 47 C.F.R. § 27.50(b)(2) and (3).

[24] The PSD and PFD limits that apply to the Lower 700 MHz bands are the same as those that apply to the upper bands. *See* 47 C.F.R. §§ 27.50(c), 27.55(b).

produce similar coverage and capacity results as those achieved in the 700 MHz bands. Third, the higher PSD limits, as compared to those proposed by AT&T, will enable carriers more closely to replicate the coverage characteristics and spectrum efficiencies they currently achieve using narrowband technologies in the cellular bands, thereby improving carriers' ability to provide broadband services in rural areas and in-building locations and throughout their cellular networks. Fourth, as discussed below, using the 700 MHz band PSD and PFD limits will not result in increased harmful interference to adjacent licensees and services, including public safety.

B. Adopting the Upper 700 MHz Band PSD and PFD Limits for Cellular Band Operations Will Not Result in Harmful Interference to Adjacent Licensees and Services.

As discussed above, the Commission has previously recognized PFD limits as an effective way to mitigate the potential for interference to adjacent licensees. By limiting PFD levels near cellular base stations, the signal levels produced by the base stations will remain low enough to enable receivers operating in adjacent spectrum bands to reject the signals, thereby avoiding harmful interference. In order to confirm that the 700 MHz PFD levels will protect adjacent receivers from harmful interference, Verizon Wireless asked V-COMM, a wireless engineering consulting firm,[25] to evaluate and test public safety radios operating in the 851-861 MHz bands to determine their ability to withstand high power signals from various wideband and narrowband commercial technology signal sources in the Cellular A and B bands.[26] V-COMM

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[25] V-COMM specializes in providing expertise to wireless operators and governmental agencies in wireless network system design, engineering, performance, optimization and interference analysis. V-COMM has experience in commercial wireless technologies and public safety operations in the 800 MHz spectrum bands.

[26] A summary of V-COMM's test results is attached to these Comments.

evaluated public safety radios operating in analog and Project 25 digital operating modes. All cellular signal types were tested. The results demonstrate that the cellular signals operating within the 700 MHz PFD limits produce desired signal levels that do not exceed the Section 22.970 requirements for unacceptable interference to non-cellular part 90 licensees in the 800 MHz bands.[27] These results and the experience to date operating broadband technologies in the 700 MHz bands demonstrate that allowing broadband technologies to operate at the 700 MHz PSD and PFD levels will not cause harmful interference to public safety licensees operating in the 800 MHz bands.

In addition to the PFD limits, Part 90 licensees operating in the cellular bands are protected by the Part 22 cellular rules for any instances of actual interference that may occur. These rules require any cellular licensee that causes or contributes to unacceptable interference to any non-cellular, Part 90 licensee to cooperate fully with the affected licensee to abate that interference and set forth procedures for resolving any such interference.[28] The PFD limits together with the existing cellular interference abatement rules and procedures will protect adjacent licensee operations from unacceptable interference from cellular licensees operating at the 700 MHz PSD limits. As discussed in the Petition and above, determining power based on PSD limits will result in broadband technologies being able to match the PSD levels and coverage characteristics currently produced by narrowband systems under the current cellular rules. Accordingly, contrary to the concerns expressed by Bluegrass Cellular,[29] the signal levels

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[27] 22 C.F.R. § 22.970.

[28] 22 C.F.R. § 22.971, 22.972.

[29] Bluegrass Cellular Comments at 3-4. Bluegrass criticisms were raised in the context of opposing AT&T's waiver request. Bluegrass did not oppose AT&T's request to open a rulemaking to consider amending the cellular rules to adopt PSD limits.

at or near the market boundaries produced by broadband technologies under the proposed PSD and PFD limits will not be greater than currently permitted and experienced levels. In addition, should operation under the proposed rules result in extensions into adjacent markets, the adjacent market licensee would be protected under the cellular rules. In particular, Section 22.907, which requires coordination of channel usage; Section 22.911(d), which protects licensees from co-channel, first adjacent channel, and capture of subscriber traffic interference; and Section 22.912, which prohibits adjacent licensees from extending service area boundaries into adjacent markets except by agreement with the adjacent licensee, all would remain in effect and serve to protect adjacent cellular licensees from harmful interference.[30]

[30] *See* 47 C.F.R. §§ 22.907, 22.911(d), 22.912.

IV. CONCLUSION

Verizon Wireless supports AT&T's Petition to amend the current cellular power limits set forth in Section 22.913 to establish Power Spectral Density (PSD) limits. This change is necessary to facilitate deploying broadband technologies in the cellular band. However, Verizon Wireless believes that the PSD limits proposed by AT&T are too low, and would prevent carriers from achieving the same coverage, capacity, and spectrum efficiencies as broadband services deployed in other bands. Instead, Verizon Wireless proposes to adopt the same PSD and Power Flux Density ("PFD') limits used in the Upper 700 MHz bands. By adding PFD limits, the FCC can allow higher and more efficient PSD limits consistent with other bands, without causing harmful interference to adjacent licensees.

Respectfully submitted,

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Certificate of Service

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